Selection and self-selection: how to determine the real impact of alcohol on health-care utilization and costs?

Rehm, Jürgen

Commentaries

SELECTION AND SELF-SELECTION: HOW TO DETERMINE THE REAL IMPACT OF ALCOHOL ON HEALTH-CARE UTILIZATION AND COSTS?

The paper by Anzai *et al.* (2005) on alcohol consumption and the use of health services finds a *U*-shaped relationship between the level of consumption and in-patient health care utilization (and costs), and an inverse relationship with frequency of out-patient care (and costs). In arriving at this conclusion, the paper avoids many of the shortcomings of the literature, i.e. small sample size, self-selection of relatively well-off social strata, drawing causal conclusions from cross-sectional data, retrospective reporting and self-report on utilization. However, there are still the following questions remaining which the study could address more adequately.

- The group of life-time abstainers may be characterized by other traits and behaviours responsible for the left side of the *U*-shaped curve/inverse relationship. There is some indication for this kind of explanation (Bondy & Rehm 1998; Cryer *et al.* 2001), especially in samples where life-time abstention is a behaviour shared by only a relatively small minority. While this explanation cannot be excluded, its omnibus character and unspecificity leaves a bitter taste.
- In the paper by Anzai and colleagues, a relatively large group of people with high levels of disease were excluded: 3361 people with either stroke, myocardial infarction, liver disease and cancer at baseline, and 1886 ex-drinkers. This corresponds to a sample size reduction of about 25%, mainly of people who drive the overall health-care costs in the sample. The reasons for specifically excluding these diseases are not clear. Alcohol is related to more than 60 *International Classification of Diseases* (ICD) codes, many not excluded from the analysis, but, on the other hand, is not related to all cancers (Rehm *et al.* 2003). However, combined with the relatively short follow-up time these exclusions present a problem, as there were probably not sufficient new events of these diseases within the follow-up period. Part of the difference between the high morbidity costs associated with alcohol in the traditional indirect analyses (e.g. Single *et al.* 1998) and the results of Anzai *et al.* (2005) can be explained by the fact that high-cost and alcohol-related diseases were excluded from these latter analyses. With respect to the second group systematically excluded, the ex-drinkers, I see no reason why they could not have been part of the statistical analyses, except for the trend calculations.
- In the current sample and procedures is the treatment of alcohol use disorders included, both in terms of the in-patient and out-patient services and, if so, what role does it play in respect to costs?
- In what way is alcohol consumption itself related to shorter in-patient stays and less frequent out-patient visits? There are some indications that people with relatively high levels of alcohol and tobacco use may have shorter stays in hospitals because they cannot exhibit these behaviours there (Single *et al.* 1996).
- Is there any information on patterns of drinking, especially in relation to irregular heavy drinking occasions, which have been linked to injury and some chronic disease (Rehm et al. 2003)?

These open questions should not take away from the strengths of the study and the analyses. The Anzai *et al.* study is certainly one of the best-controlled and thus most informative studies on the topic. However, for the remaining questions, it would be extremely valuable to have additional analyses on the other characteristics of life-time abstainers, and similar types of analyses with a longer follow-up period. Also, some sensitivity analyses including the people with various diseases at baseline, plus the estimated alcohol relationship, would help in determining the real costs or potential savings incurred by alcohol.

JÜRGEN REHM
Senior Scientist and Co-Head, Section Public Health and Regulatory Policies
Centre for Addiction and Mental Health
33 Russell Street
Room 2035
Toronto
Ontario
Canada M5S 2S1
E-mail: jtrehm@aol.com

 doi:10.1111/j.1360-0443.2004.00927.x

References

Anzai, Y., Kuriyama, S., Nishino, Y., Takahashi, K., Ohkubo, T., Ohmori, K., Tsubono, Y. & Tsuji, I. (2005) Impact of alcohol consumption upon medical care utilization and costs in men: 4-year observation of National Health Insurance beneficiaries in Japan. *Addiction*, **100**, 19–27.

Bondy, S. & Rehm, J. (1998) The interplay of drinking patterns and other determinants of health. *Drug and Alcohol Review*, **17**, 399–411.

Cryer, P. C., Saunders, J., Jenkins, L. M., Neale, H., Cook, A. C. & Peters, T. J. (2001) Clusters within a general adult population of alcohol abstainers. *International Journal of Epidemiology*, **30**, 756–776.

Rehm, J., Room, R., Graham, K., Monteiro, M., Gmel, G. & Sempos, C. T. (2003) The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease—an overview. *Addiction*, **98**, 1209–1228.

Single, E., Robson, L., Xie, X. & Rehm, J. (1998) The economic costs of alcohol, tobacco and illicit drugs in Canada, 1992. *Addiction*, **93**, 991–1006.

Single, E., Robson, L., Xie, X., Rehm, J., in collaboration with Moore, R., Choi, B., Desjardins, S. & Anderson, J. (1996) *The Costs of Substance Abuse in Canada*. Ottawa: Canadian Centre on Substance Abuse.

ALCOHOL CONSUMPTION AND HEALTH SERVICES COSTS

The study in this issue on the association between alcohol consumption and costs of health services among Japanese men [1] provides us with interesting and thought-provoking results. The study shows that utilization of medical care displays different associations with alcohol consumption, depending on whether the medical care is in-patient care or out-patient care. Yet, for both types of medical care the life-long abstainers appear to use more health services than any category of current drinkers. The study is based on a strong data set, and the results provide a valuable contribution to a field where previous studies have yielded rather diverse findings regarding the association between alcohol consumption and health care utilization, due probably to various methodological shortcomings. Nevertheless, I believe we are still left with two major concerns: how to interpret the findings, and what their impact will be.

Tables 3 and 4 in Anzai *et al*.'s study [1] show that life-long abstainers spend, on average, significantly more days in hospital per month than current light or moderate drinkers (up to 450 g alcohol per week), also when controlling for some confounders. The authors suggest that the observed associations between alcohol use and use of in-patient care reflect an impact of alcohol consumption on morbidity and a beneficial effect of light drinking on morbidity. However, even in the youngest age group (40–49 years) the life-long abstainers used significantly more in-patient care than those consuming up to 450 g per week, corresponding to 22–33 standard units of alcohol per week or up to 43–64 g per day. Although a number of studies indicate a beneficial effect of moderate drinking on coronary heart disease among males, these studies also indicate that the beneficial effect is found for lower daily consumption levels (<40 g per day) and only among those over 45 years [2]. We should also keep in mind that the incidence of other health consequences (e.g. cancer and injuries) tends to increase with increasing consumption [2]. Consequently, I am not convinced that the observed lower in-patient care among moderate consumers (up to 450 g per week) compared to life-long abstainers reflect an overall beneficial effect on morbidity. Moreover, the figures given in Table 3 in Anzai *et al*.'s article [1] imply that a day in hospital is, on average, significantly less costly for life-long abstainers than for any category of current drinkers, whereas the opposite is the case with respect to a physician visit. Hence, one alternative explanation for the observed findings could be that life-long abstainers display another morbidity pattern than moderate drinkers (for instance more psychosomatic and mental health complaints), and furthermore that such morbidity patterns may affect drinking habits, whether directly or mediated by social network integration. This could be addressed more adequately in future studies if the type of data and strong study design applied in Anzai *et al*.'s study could be combined with data on morbidity and social integration.

My second concern relates to the possible implications of the study results. If we (from the figures given in Table 3) calculate the total medical care costs per month for life-long abstainers and the various categories of current drinkers, we find that the costs are clearly highest among the life-long abstainers; for instance, 23% higher than among those with a weekly alcohol intake between 300 and 449 g and 7% higher than among those with the highest alcohol intake. Irrespective of what the underlying mechanisms for such cost differences might be, we may wonder how employers and health insurance systems will respond to this.

INGEBORG ROSSOW
Norwegian Institute for Alcohol and Drug Research
POB 565 Sentrum
N-0105 Oslo
Norway
E-mail: ir@sirus.no

References

1. Anzai, Y., Kuriyama, S., Nishino, Y., Takahashi, K., Ohkubo, T., Ohmori, K., Tsubono, Y. & Tsuji, I. (2005) Impact of alcohol consumption upon medical care utilization and costs

in men: 4-year observation of National Health Insurance beneficiaries in Japan. *Addiction*, **100**, 19–27.
2. Babor, T., Caetano, R., Casswell, S., Edwards, G., Giesbrecht, N., Graham, K., Grube, J., Gruenewald, P., Hill, L., Holder, H., Homel, R., Österberg, E., Rehm, J., Room, R. & Rossow, I. (2003) *Alcohol: No Ordinary Commodity—Research and Public Policy*, pp. 57–75. New York: Oxford University Press.

ALCOHOL AND IN-PATIENT UTILIZATION: WHAT IS THE SHAPE OF THE RELATIONSHIP?

The costs of alcohol use to society are well known and numerous, including material and personal losses. Costs to social service and health-care systems are important to estimate, but the published literature on this topic is contradictory. Many studies have found associations between alcohol use and utilization or cost of health services. In the case of out-patient utilization, an inverse relationship has consistently been found. However, the magnitude and shape of the relationship to in-patient care has not been consistent. The following question has not been answered conclusively: 'Is there a relationship between alcohol consumption and inpatient medical care utilization and cost and, if so, what is the shape of the relationship?

As Anzai *et al*. (2005) point out, various investigators have characterized the alcohol–in-patient utilization association as linearly positive, linearly inverse, *J*-shaped, inverse-*J*-shaped and *U*-shaped. On the surface, these results are contradictory. However, is it reasonable to compare these studies? I maintain that comparison is hindered by the inconsistent definitions of drinking categories and the variability of drink size. For example, in Anzai *et al*. (2005), a *U*-shaped association was observed, using five categories of drinkers defined in terms of grams per week: 0 (life-long abstainers), 1–149, 150–299, 300–449 and ≥450. These categories are equivalent to approximately 0, <11, 11–21, 21–32 and >32 standard drinks per week, given the usual definition of a standard drink of about 14 g of ethanol. On the other hand, Armstrong *et al*. (1998) observed a somewhat inverse linear association for men, but we utilized four categories of drinkers, equivalent to 0 (current abstainer), <7, 7–13 and ≥14 drinks per week. Thus, the shapes of the associations found between alcohol consumption categories and utilization for these two studies is based on totally different alcohol categories and therefore the comparison is flawed. In addition, in the Armstrong study, the abstainer category includes ex-drinkers and in the Anzai study it does not. In another article cited by Anzai (Armstrong & Klatsky 1989), eight drinking categories were used, based on a question from a self-administered questionnaire which asked about number of drinks consumed in a specified time period (day or month), but not how big the drinks were nor how many days per week or month the individual drank. There is a reasonably large literature on standard drink size, including research that has shown that people have a tendency to underestimate the size of their drinks in terms of number of standard drinks, thus underestimating the amount of alcohol they consume. Gender is another important factor to consider, as the association appears to differ by gender.

Is there a 'right' way to analyse the association between alcohol consumption and utilization? There may not be a right way, but there are certainly better ways that facilitate understanding and interpretation of multiple studies. Using gender-specific, standardized definitions of drinking categories, such as those for 'light', 'moderate', and 'heavy' drinking as defined by the CDC and NIAAA, separating life-long abstainers from ex-drinkers, stratifying analyses by gender, and specifying the quantity of alcohol consumed in terms of standard drinks of each beverage type would permit more precise comparisons of studies.

MARY ANNE ARMSTRONG
Kaiser Permanente
Division of Research
2000 Broadway
Oakland
CA 94612
USA
E-mail: maryanne.armstrong@kp.org

References

Anzai, Y., Kuriyama, S., Nishino, Y., Takahashi, K., Ohkubo, T., Ohmori, K., Tsubono, Y. & Tsuji, I. (2005) Impact of alcohol consumption upon medical care utilization and costs in men: 4-year observation of National Health Insurance beneficiaries in Japan. *Addiction*, **100**, 19–27.

Armstrong, M. A. & Klatsky, A. K. (1989) Alcohol use and later hospitalization experience. *Medical Care*, **27**, 1099–1108.

Armstrong, M. A., Midanik, L. T. & Klatsky, A. L. (1998) Alcohol consumption and utilization of health services in a health maintenance organization. *Medical Care*, **36**, 1599–1605.

THE RELATIONSHIP BETWEEN ALCOHOL CONSUMPTION AND HEALTH CARE UTILIZATION AMONG MEN IN JAPAN: A REPLY TO THE COMMENTARIES

We wish to thank Jürgen Rehm, Ingeborg Rossow and Mary Anne Armstrong for their detailed comments on our paper.

Reply to Jürgen Rehm (2005)

Two papers (Bondy & Rehm 1998; Cryer *et al.* 2001) were fundamentally different from our study because we distinguished ex-drinkers from lifelong abstainers. We thought that lifelong abstainers consisted of two groups: those who did not drink because of ill health and those who chose not to drink for other reasons. It seemed likely that there would be many people in the ill health group, or that people in poor health would incur high medical care costs. However, in the event as shown in Table 1 (Anzai *et al.* 2005), our study showed that the disease history of lifelong abstainers was not significantly different from the group of current drinkers. Thus it was not essential to divide these two groups in order to conduct the analysis.

We did not include ex-drinkers in our study because this group had a high level of morbidity, as noted in many other studies, and we wished to estimate a more correct dose–response relationship. Inclusion of people who had already stopped drinking at the baseline would have complicated the situation.

The treatment of disorders related to alcohol consumption was included in the study data. But we are unable to answer the question 'what role does it play with respect to costs?' Information on the diagnosis related to each episode of medical care was not available. The comment about shorter inpatient stay and less frequent outpatient attendance among heavy alcohol drinkers is interesting. However, we cannot address this comment because we have no relevant information, nor do we have any data about irregular heavy drinking bouts.

Reply to Ingeborg Rossow (2005)

Rossow stated that 'lifelong abstainers display another morbidity pattern than moderate drinkers (for instance more psychosomatic and mental health complaints)' and 'this could be addressed more adequately in future studies if the kind of data and strong study design applied in Anzai *et al*.'s study could be combined with data on morbidity and social integration'. Here we make the same reply as to Rehm.

As Rossow points out, the total medical costs of lifelong abstainers were the highest. In Japan, the remarkable rise of medical care costs has become a serious financial issue at both national and local government level. However, little attention has been paid to the medical care costs of lifelong abstainers. Under the present situation, where the medical characteristics of lifelong abstainers are unclear, there is no plan to include budgeting for lifelong abstainers in medical care cost assessment. Medical care expenses for ex-drinkers are about double those for other groups. Programs that have been urged in Japan centre on healthy current drinkers, and provide information about safe or low-risk levels of alcohol drinking.

Reply to Mary Anne Armstrong (2005)

Armstrong points out that classifications of the quantity of drinking have varied considerably among studies, and that this may explain the differences in results on the relationship between hospitalization and drinking. The study by Armstrong *et al*. (1998) classified most quantities of drinking that would be assumed to be moderate into four categories, with a standard drink being about 14 g of ethanol. Classifications of drinking differ among countries according to national habits. Our classification was made on the basis of a previous study done in Japan (Tsugane *et al*. 1999), where one cup of *sake* is the basic unit and other alcohol beverages are converted to their *sake* equivalent. One cup of *sake* contains 20–23 g of ethanol. When compared with studies from many other countries, one cup of *sake* contains considerably more ethanol than the standard unit.

As Armstrong notes, it is conceivable that different studies demonstrated different relationships between medical care costs and drinking because different distributions in the quantity of alcohol drunk were adopted.

YUKIKO ANZAI
Miyagi University School of Nursing
1 Gakuen
Taiwa-cho
Miyagi-ken 981–3298
Japan
E-mail: anzai@myu.ac.jp

References

Anzai, Y., Kuriyama, S., Nishino, Y., Takahashi, K., Ohkubo, T., Ohmori, K., Tsubono, Y. & Tsuji, I. (2005) Impact of alcohol consumption upon medical care utilization and costs in men: 4-year observation of National Health Insurance beneficiaries in Japan. *Addiction*, **100**, 19–27.

Armstrong, M. A. (2005) Alcohol and inpatient utilization: what is the shape of the relationship? *Addiction*, **100**, 30.

Armstrong, M. A., Midanik, L. T. & Klatsky, A. L. (1998) Alcohol consumption and utilization of health services in a health maintenance organization. *Medical Care*, **36**, 1599–1605.

Bondy, S. & Rehm, J. (1998) The interplay of drinking patterns and other determinants of health. *Drug and Alcohol Review*, **17**, 399–411.

Cryer, P. C., Saunders, J., Jenkins, L. M., Neale, H., Cook, A. C. & Peters, T. J. (2001) Clusters within a general adult population of alcohol abstainers. *International Journal of Epidemiology*, **30**, 756–776.

Rehm, J. (2005) Selection and self-selection. How to determine the real impact of alcohol on health care utilization and costs. *Addiction*, **100**, 28–29.

Rossow, I. (2005) Alcohol consumption and health service costs. *Addiction*, **100**, 29–30.

Tsugane, S., Fahey, M. T., Sasaki, A. S. & Baba, S. for the JPHC Study Group. (1999) Alcohol consumption and all-cause and cancer mortality among middle-aged Japanese men: seven-year follow-up of the JPHC study cohort. *American Journal of Epidemiology*, **150**, 1201–1207.